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1 Introduction

Saskatchewan has a long history in aviation. Roland Groome, the first commercial pilot in the country, earned his license in Regina in 1920. A pioneer of aviation, Groome's airfield was Canada's first licensed airport and his partner, Robert McCombie, was the country's first licensed air maintenance engineer. Together they formed the company Aerial Service Company, and built Canada's first licensed commercial aircraft, the JN-4 Canuck.

Saskatchewan is again taking the lead in the area of industry wide human resource and training planning. It is the first province to undertake a study encompassing all occupations in the aviation industry. This literature review is part of the study, intended to provide an overview of the issues in the industry nationally, internationally, and provincially.

2 The Canadian Aviation Industry: An Overview

Since the early 1990s Canada's aviation industry has undergone significant changes. The role of the federal government has been dramatically reduced, industry has assumed key responsibilities formally in the government's domain, provincial and municipal governments are becoming more involved in aviation through local airport authorities, and international events have significant impact locally.

2.1 Changing Infrastructure

Starting in the early 1990s, the federal government has transferred responsibility for financing and controlling aviation infrastructure and operations to the industry itself. Transport Canada has been transformed from an operating and regulatory department to a policy and regulatory body. Responsibility for air navigation, pre-flight security, and airport services now lie with industry.

The Air Transport Security Corporation (ATSC) now owns and operates the equipment that screens passengers and their carry on baggage. It conducts pre-flight security in keeping with regulations set out by Transport Canada. ATSC, a not-for-profit, non-share company whose Board of Directors is appointed by ATAC, is also engaged in ongoing research and development to improve airport security measures.

NAV CANADA is another not-for profit corporation set up to deal with the transfer of responsibility from the government to the industry. It owns and operates the Canadian civil air navigation service (ANS), which provides air traffic control, flight information, weather briefings, airport advisory services, and electronic aids to navigation across the country.

In 1998, NAV CANADA became completely independent of government funding and finances operations by user charges. The challenge for the organization is to operate safely while meeting its commitment to reduce operating costs by $135 million over three years. Efforts to reduce operating costs means that NAV CANADA has committed to making user fees an increasingly smaller percentage of air carrier costs. The challenge of this commitment is exceptional when considered against an international trend that has air navigation and airport charges rising faster than any other category of air carrier costs.

Another major component of the transition from federal to industry control, is the commercialization of Canada's airports. Twenty-six national and 70 regional and local airports are slated for release by April 2000. Among the challenges of commercialization have been the renegotiations of existing leases, accountability, the viability of smaller airports, and airport improvement fees.

Anyone who has flown out of major Canadian airports in the last few years has had to pay airport improvement fees. In some cities, such as Calgary, Winnipeg and Kelowna, local airport authorities have agreed to have industry collect fees in return for industry input into the type and extent of capital projects.[1]

2.2 ATAC

The Air Transport Association of Canada (ATAC) is the national association whose mission it is to reflect industry requirements in a dramatically changing environment. ATAC reviews all proposed legislation or regulation affecting air transportation in draft form and formulates their position to present to government. They provide a forum for industry to discuss and exchange information on legislation, regulatory and operational actions, issues and industry's position. ATAC acts as industry's public voice on national and regional issues.

In terms of the federal release of many of its air transport responsibilities, ATAC has played a large role in these changes. They appoint all nine members of the Board of Directors of ATSC and four members to the NAV CANADA board. ATAC is also considering adding additional airports to cope with change in airport infrastructure. Their goal is to ensure that all airports remain part of a national system and to ensure accountability and on-going viability as the transition is completed. [2]

2.3 The Open Skies Agreement

The Open Skies agreement, signed in February 1995, between Canada and the United States provided for virtually unrestricted access to carriers from both countries on transborder routes after a three-year transition period. Under the agreement, Canadian air carriers gained unlimited rights to establish routes from any point in Canada to any point in the United Sates. US carriers had similar access, with the exception of Montreal, Toronto, and Vancouver. These restrictions were lifted by February 1998.

The result has been significant increases in transborder traffic. By February 1998, 97 new scheduled services had been added by Canadian and US carriers; 40% of these in Toronto, 25% in Vancouver and 8% in Montreal. Transport Canada estimates that 1.8 million more business travelers and tourists from the US arrive in Canada by air compared to pre-agreement levels.[3]

2.4 Market Growth

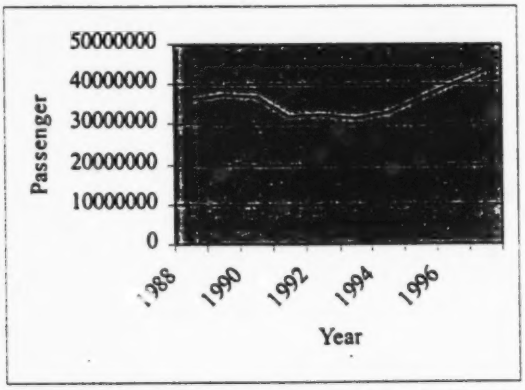
In 1996, Canadian air carriers generated revenues of over $10 billion. This is based mainly on scheduled and charter passenger service and cargo delivery. According to ATAC, next to the family car, Canadians first travel choice is by air and they fly more often and for longer flights

[1] Air Transport Association of Canada website.
[2] Ibid.
[3] Transport Canada website.

than anyone else in the world. Since 1997, Canadians are taking more vacations and flying more on business than ever before. Canadian carriers have also seen significant growth in air cargo. Despite the fluctuations in cargo volumes over the last 25 years, airlines in Canada are carrying increasing amounts of cargo, in part due to increasing consumer demands for worldwide products all year round and quick package delivery.

The graph below outlines the numbers of passengers carried by Canadian air carriers, levels I – IV from 1988 – 1997. As the graphs below indicates, total numbers of passengers dropped from 36 million in 1988 to 31 million in 1993 before beginning to ascend again to current levels of 43 million.

Figure 1: Passengers, 1988 - 1997



1997 data is preliminary. (Source: Statistics Canada, Aviation Statistics Centre courtesy of ATAC)

From 1993 to 1997 there was also a steady increase in the number of revenue passenger miles, as the table below indicates. However, the average passenger journey remained fairly constant. People are not typically flying farther, but more people are flying in Canada.

Table 1: Revenue Passenger Miles 1993 – 1997, Air Carriers Levels I - IV

Year	Unit Toll (000)	Charter (000)	Total (000)	Average Passenger Journey (miles)
1997*	43,320,798	13,633,784	56,954,581	1,203
1996	39,511,419	11,515,834	51,027,254	1,174
1995	34,002,938	11,664,024	45,666,961	1,256
1994	29,318,581	11,465,637	40,784,218	1,241
1993	27,271,549	10,479,678	37,751,227	1,199

*Preliminary. (Source: Statistics Canada, Aviation Statistics Centre courtesy of ATAC)

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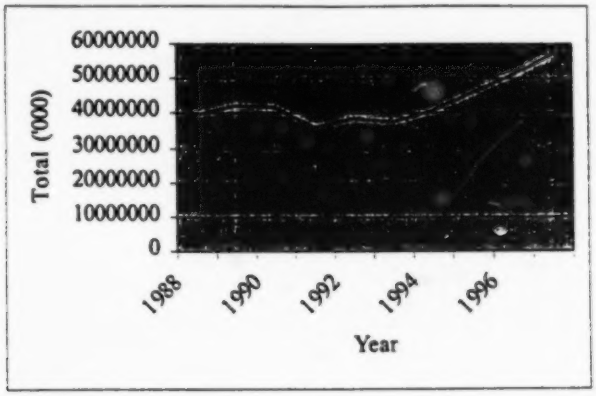
The graph below shows the increase in total revenue passenger miles from 1988 to 1997.

Figure 2 Total Revenue Passenger Miles



Growth in the Canadian airline industry can also be viewed in terms of numbers of commercial aircraft. As the table below indicates, there has been a slow but steady increase in the numbers of commercial airplanes and helicopters registered in Canada.

Table 2: Canadian Aircraft Registered, 1994 - 1998

Year	Airplanes	Helicopters	Total
1998*	4,839	1,235	6,074
1997	4,756	1,256	6,012
1996	4,642	1,231	5,873
1995	4,569	1,197	5,766
1994	4,516	1,191	5,707

*As of August 31, 1998. (Source: Transport Canada, Canadian Civil Aircraft Register courtesy of ATAC.)

Highly relevant to the Canadian airline industry is American cross-border traffic. From 1994 to 1997 Canadian business travel to the United States increased from 15% of all Canadian business trips to 21%. On the flip side, American tourists are increasingly choosing Canada as a preferred destination. Since the signing of the Canada-US Open Skies Agreement in 1995, it is estimated that 300,000 new US tourists have visited Canada each year. To accommodate the increase in US-Canada travel, almost 100 new scheduled services have been added by Canadian and US carriers. Air Canada is responsible for much of the trans-border traffic; they have nearly as many cross-border flights as all the US airlines together.[4]

In part, the growth in Canada's airline industry is fueled by international growth. The International Air Transport Association (IATA) is predicting Asia-Pacific volume, a major destination of many Canadians, to almost double in the next decade. South American passenger growth is expected to increase 8% by 2004. As the world's economic and socio-political landscape is changing, travel becomes easier into and out of places like Eastern Europe, China, and South Africa. In 1998, the world's airlines carried an estimated 36%, or 1.5 billion more passengers than a decade before.[5]

[4] AT2AC website.
[5] "Turbulence Ahead," by Noel Hulsman, Financial Post Magazine, August 1999.

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[4] AT2AC website.
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2.5 U.S. & International Forecasts

The Federal Aviation Administration (FAA) is forecasting a 63% increase in revenue passenger miles by 2010. In those same ten years, the number of passengers that will be travelling American airways will be up 49%. Domestic departures will increase from 7.2 million to 9.9 million. The American Association of Airport Executives is warning that current airport capacity is not capable of handling predicted growth. The table below outlines expected growth until 2010.

Table 3: Commercial Air Carriers 1999-2010

Year	Passengers (in millions)	Rev. Passenger Mi. (in billions)	Jet Aircraft in Fleet	Domestic Departures (in millions)
1999	623.9	638.4	5,433	7.2
2000	639.9	661.8	5,610	7.4
2001	656.9	687.7	5,822	7.6
2002	682.9	721.3	6,052	7.8
2003	710.2	756.8	6,320	8.0
2004	738.2	792.7	6,572	8.3
2005	767.4	830.3	6,903	8.6
2006	798.0	869.3	7,170	8.8
2007	830.0	910.0	7,448	9.1
2008	862.4	951.9	7,737	9.4
2009	896.1	995.9	8,040	9.6
2010	931.1	1,041.6	8,360	9.9

Source: FAA, courtesy of Aviation Week & Space Technology, October 25, 1999.

According to the International Civil Aviation Organization, total scheduled passenger traffic of the world's airlines is expected to grow at 4% in 1999, 5% in 2000, and nearly 6% in 2001. Passenger-kilometres are expected to rise from 2,739 billion in 1999 to 2,875 billion in 2000 and 3,038 billion in 2001. Traffic in the Asia/Pacific region is expected to grow at the highest rate among ICAO regions, although the pace will be slower than growth over the last decade in that region. European and Latin American/Caribbean airlines can expect a "reasonably buoyant" market, according to the ICAO. Middle Eastern, African and North American airline markets can expect moderate growth. The table below summarizes ICAO forecasts.

Table 4 ICAO Scheduled Passenger Traffic Forecast, 1999-2001

		Forecast		
Region	Average annual growth (%) 1987-1997	1999 (%)	2000 (%)	2001 (%)
Africa	4.6	4.0	5.0	5.3
Asia Pacific	9.7	4.3	5.9	6.9
Europe	2.9	4.4	5.7	6.0
Middle East	5.6	3.6	4.8	5.8
North America	4.1	3.9	3.8	4.6
Latin America/ Caribbean	5.0	4.1	5.7	6.5
World	4.9	4.1	5.0	5.7

Source: International Civil Aviation Organization, October 1999.

Beyond 2001, air traffic will continue its strong growth. In the period 1985-1995, passenger-kilometers grew an average annual rate of 5% per annum. From 1995-2005, the ICAO is predicting passenger-kilometre growth to average out at 5.5% per annum. International traffic is expect to increase at 7% per annum, while domestic traffic is forecasted at an average annual rate of 3.5%. Total freight traffic growth over the same period is expected to be even stronger, at 7% per annum in terms of freight tonne-kilometres. International cargo hauling is expected to increase by 7.5% per annum, compared to a domestic growth rate of 3.5%. Aviation growth is expected to outpace world economic growth. World GDP is forecasted at an average annual rate of 2.5%.[6]

2.6 Technology

Any search for information on Canadian aircraft technology will turn up the "Avro Arrow." Designed as a defence against Russian bombers during the Cold war, the CF – 105 was a source of Canadian pride and symbolized Canadian engineering ingenuity.[7] Since that time, Canada has become a leader in aerospace technology development and manufacturing. The fifth largest aerospace industry in the world, Canada is a leader in regional aircraft, business jets and commercial helicopters.[8]

Headquartered in Montreal, Bombardier is the third largest civil aircraft manufacturer in the world. Over the last 12 years, Bombardier has acquired Canadair and de Havilland in Canada, Learjet in the US and Shorts in the UK, making it the only aerospace manufacturer in the world located in three countries. Approximately 80% of Bombardier Aerospace's business is the design and production of regional aircraft and business jets. The remaining 20% are in amphibious aircraft, airframe components and nacelles. The company employs over 31,000 employees worldwide, 22,000 of which are located in Canada. With markets in five continents, Bombardier generates about (Cdn)$11.5 million in yearly revenues, $6.4 million of which from its aerospace division.[9]

Bombardier is a large and growing Canadian company and its growth is spurred by the ever-growing airline industry. With more aircraft in the air than ever, NAV CANADA has refined its Gander Automated Air Traffic System (GAATS) to handle the increased volume. GAATS is a navigational tool that allows controllers to keep track of flights over the North Atlantic, currently the world's busiest oceanic airspace. Aircraft, unable to rely on radar to gauge their position over the ocean, now rely on GAATS. This device allows controllers to monitor an aircraft's position to such accuracy that the recommended vertical space separation between aircraft has been cut in half to 1,000 feet.

[6] "Outlook for Air Transport to the Year 2005," International Civil Aviation Organization. Excerpts published on website, 1999.
[7] For more information about the Arrow see "The Avro Arrow assumed mythic proportions," J.L Granatstein & Norman Hillmer, Maclean's, v.112 (26), July 1999.
[8] "Canada's aerospace industries collaborate with program to help global competition," by Lisa Fattori, Silicon Valley North, v.3 (5), July, 1999.
[9] Bombardier website.

2.7 Y2K

Companies all over the world are preparing for January 1, 2000, and the air transport industry is no exception. The International Air Transport Association (IATA) predicts that international carriers alone will spend $1.6 billion to address internal Y2K issues. In addition, airline suppliers, airports and government agencies all must address Y2K threats to ensure smooth and safe operation in the beginning of the new millenium. The American Transport Association, ATAC and IATA are working together in an international effort to address Y2K, at a cost of over (US)$45 million.

2.8 Safety

According to the International Civil Aviation Organization (ICAO), there were 5 fewer aircraft accidents involving fatalities in 1998 than in 1997, resulting in 21 fewer deaths worldwide. While this appears to indicate a reduction in aircraft accidents and increased levels of safety, there was actually no significant change in passenger fatalities per 100 million passenger kilometres.[10]

Nationally the Transportation Safety Board of Canada, is calling for an industry-wide effort to tighten management of commuter, air taxi and charter operations to ensure companies do not operate in a manner that cuts the margins of safety. Because these operations involve more take-offs and landings than large carriers and they often operate in harsher weather conditions and with less than precise instrumentation than at major airports, they can place passengers and crew at unnecessary risk. In terms of large passenger aircraft, collisions between aircraft and with other objects have fallen from 224 in 1997 to 185 in 1998. However, the five-year average has risen from 151 to 180 in the last four years. While the national Transportation Safety Board, indicates that the rising statistics may be a result of more effective radar coverage, it is calling for industry, NAV CANADA and the regulator to address the rising trend before there is a collision involving large passenger aircraft.[11]

[10] ICAO Update, International Civil Aviation Organization, March 1999.
[11] "Key Safety Issues, 1999," Transportation Safety Board of Canada, 1999.

The table below outlines the accidents involving Canadian registered aircraft by province between 1994 and 1997. Although it is difficult to compare provinces without know passenger-kilometre information, clearly higher traffic provinces such as Ontario, BC, and Quebec have higher accident frequencies than other provinces. The Transportation Safety Board defines reportable aviation accidents as:

> An accident resulting directly from the operation of an aircraft where;
>
> a) a person sustains a serious injury or is killed as a result of;
>
> i) being on board the aircraft,
>
> ii) coming into contact with any part of the aircraft or its contents, or
>
> iii) being directly exposed to the jet blast or rotor downwash of the aircraft,
>
> b) the aircraft sustains damage that adversely affects the structural strength, performance or flight characteristics of the aircraft and that requires major repair or replacement of any affected component part, or
>
> c) the aircraft is missing or inaccessible.

Table 5: Accidents Involving Canadian Registered Aircraft by Province, 1993 - 1997

Province	1993	1994	1995	1996	1997	5 Year Averages
Newfoundland	8	10	9	10	9	9.2
PEI	2	0	0	2	1	1
Nova Scotia	7	9	8	5	4	6.6
New Brunswick	6	4	5	1	6	4.4
Quebec	76	70	78	39	58	64.2
Ontario	119	84	74	72	84	86.6
Manitoba	25	12	29	18	25	21.8
Saskatchewan	18	23	28	24	22	23
Alberta	39	51	46	56	45	47.4
British Colombia	88	82	72	82	72	79.2
NWT	19	16	16	13	10	74
Yukon	7	7	11	11	5	8.2
Outside Canada	8	12	14	8	12	10.8
Total	**422**	**380**	**390**	**342**	**353**	**377.4**

(Source: Transportation Safety Board of Canada, 1997 Preliminary Transportation Occurrence Statistics)

ATAC clearly believes that airline travel is safer than ever, and Canadians are well justified in placing their trust in Canadian airlines.[12] In fact, Canadian scheduled carriers have an enviable safety record. Last year Canadian registered airlines were involved in 14 accidents with no fatalities. This compares with an average of one fatality per year in the previous five years.[13]

[12] ATAC website.
[13] "Turbulence ahead," Noel Hulsman, Financial Post Magazine, August 1999.

While it is a largely accepted fact that airline travel is safe, there are growing safety concerns related to increased sky traffic. The ICAO forecasters predict an average annual increase of 5.5% in passenger-kilometres over the next 5 years. International traffic is expected to increase 7% per year, while domestic traffic is expected to increase at an average annual rate of 3.5%. Freight traffic is predicted to increase by 7% per year until 2005 in terms of tonne-kilometre.[14] As the skies get more crowded, the air transport industry must increasingly rely on ever more sophisticated technology and proven quality training for all persons involved.

While technology is making it possible for more planes to navigate the sky (Satellite-based surveillance programs can monitor aircraft with greater precision than ever before; NAV CANADA's GAATS has reduced the recommended vertical space separation from 2,000 to 1,000 ft), there is concern over the growing mismatch between technology and the competency of the people operating it. Dr. Assad Kotaite, president of the ICAO, has expressed grave concerns about the persistence of human error and its dangerous ramifications. As well, as the lead investigator of the FAA's search into the cause of the ValuJet DC-9 crash into the Florida Everglades indicates "complex organizations guided by risky technologies within unpredictable environments will sooner or later experience system failures." The verdict; the ValuJet crash was caused by a dizzying array of human error.[15] While human error may be a factor in aviation safety, the industry is working towards providing the best training possible and in conducting extensive research and development in the human factors field.[16]

3 Human Resources in Canada

Air transport and related industries employ 78,100 people in Canada and provide their employees with an average annual salary of $47,546. The industry expends about $2.5 million in salaries and wages yearly. Airline employees took care of 43.4 million passengers in 1997 and hauled 856 million kilograms of goods.[17]

3.1 An Overview

3.1.1 Employment Levels in Canada

In 1996, air transport industries employed 61,185 people. Service industries incidental to air transport employed an additional 16,915. As the table below shows, 66% the employees in air transport are males.

Table 6: Employment levels

Industry	Male	Female	Total
Air transport	38,475	22,710	61,185
Incidental services	12,865	4,045	16,915
Total	**51,340**	**26,755**	**78,100**

(Source: Statistics Canada, Census, 1996)

[14] "Outlook to the Year 2005," ICAO, 1997.
[15] "Turbulence ahead," Noel Hulsman, Financial Post Magazine, August 1999.
[16] ATAC Annual Report, p.3.
[17] ATAC Annual Report, p. 43.

Levels I – IV air carriers employ the largest percentage of people in air transport. According to Transport Canada, in 1997 air carriers employed 52,896 people. In 1996, air carrier employment was 51,542 or 66% of employees in air transport and incidental services. The numbers of people employed by carriers has increased steadily over the last 5 years, as the table below demonstrates, from 47,317 in 1993 to 52,896 in 1997.

Table 7: Number of Employees, Air Carriers Level I - IV

Year	Numbers Employed
1997	52,896
1996	51,542
1995	50,380
1994	47,992
1993	47,317

(Source: Statistics Canada, 1999 courtesy of Transport Canada)

Over the last 25 years, the number of air carrier employees has slowly increased as a percentage of the transportation industry. Even within the last 5 years, there have been increases, however the last two years have remained fairly steady. In 1997, 11.7% of employees in transportation were employed by levels I – IV air carriers. This was down slightly from the previous year, which saw air carrier employment level at 11.85% of total transportation employment. As a percentage of the overall economy, air carriers employ slightly more employee's than previous years. The table below outlines the level of air carrier employment as a percentage of transportation employment and all employment.

Table 8: Air Carriers Share of Total Employees

Year	% of Transport	% of Economy
1997	11.7	0.47
1996	11.85	0.47
1995	11.4	0.46
1994	10.8	0.45
1993	10.7	0.45

(Source: Statistics Canada, 1999 courtesy of Transport Canada)

3.1.2 Salaries and Wages of Canadian Air Carriers

Air carriers paid out over $2.5 million in wages and salaries in 1997. The average salary for employees with air carriers in 1997 was $47,546, up slightly from the 1996 average salary at $47,437. Calculated in 1992 dollars, the average salary in 1997 was $39,145, down from the previous year at $40,265. As the table below shows, calculated in current dollars, average salaries have increased, however slightly, each year from 1993. Calculated using 1992 dollars however, average salaries have remained relatively stable.

Table 9: Average Salaries of Air Carrier Employees

Year	Current Dollars	1992 Dollars
1997	$47,546	$39,145
1996	$47,437	$40,265
1995	$44,958	$39,649
1994	$42,152	$39,099
1993	$41,729	$40,435

(Source: Statistics Canada, 1999 courtesy of Transport Canada)

3.1.3 Productivity

Over the last 5 years, employees with passenger air carriers have increased their productivity 35%, from 4.2 passenger-kilometres in 1993 to 5.8 passenger-kilometres in 1997. Similarly employees with cargo carriers have increased their productivity in tonne-kilometres per employee by 34% from 1993 to 1997.

Table 10: Productivity of Employees with Cargo and Passenger Carriers

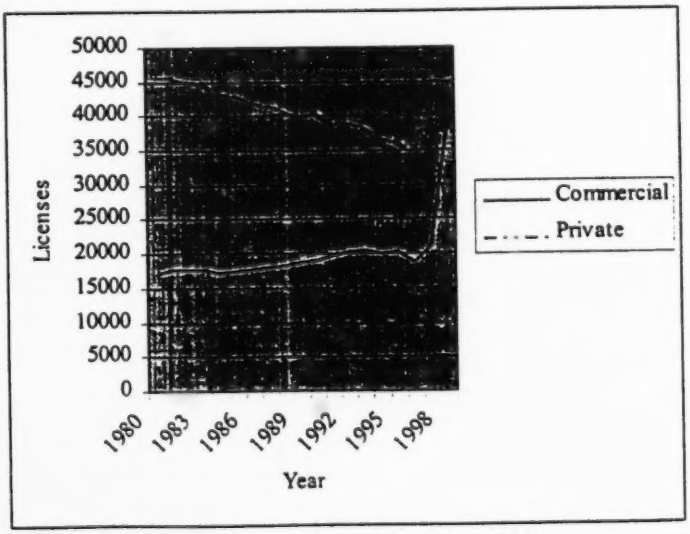
Year	Tonne-kms per employee	Passenger-kms per employee
1997	6.8	5.8
1996	6.3	5.3
1995	5.8	4.9
1994	5.4	4.6
1993	5.1	4.3

(Source: Statistics Canada, 1999, courtesy of Transport Canada)

3.2 Pilots

Last year there were over 61,200 commercial and private pilots in Canada. Examined over an 18 year period, the numbers of licensed pilots has fluctuated from year to year, but remains within the range of 53,401 and 63,450. The early 1980s saw nearly twice the number of private pilots than in recent years, while the numbers of commercial pilots has more than doubled since 1980. As the graph below shows, the numbers of private pilots have slowly but steadily declined since the 1980s, with the largest decrease in most recent years. The trend among commercial pilots is almost exactly the opposite; there has been a slow increase from the early 1980s until the late 1990s, with a dramatic rise from 1996 to 1998.

Figure 3: Commercial v. private licenses



(Source: Transport Canada, Safety and Security, 1999)

Levels I – IV air carriers employ the largest percentage of people in air transport. According to Transport Canada, in 1997 air carriers employed 52,896 people. In 1996, air carrier employment was 51,542 or 66% of employees in air transport and incidental services. The numbers of people employed by carriers has increased steadily over the last 5 years, as the table below demonstrates, from 47,317 in 1993 to 52,896 in 1997.

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1993	47,317

(Source: Statistics Canada, 1999 courtesy of Transport Canada)

Over the last 25 years, the number of air carrier employees has slowly increased as a percentage of the transportation industry. Even within the last 5 years, there have been increases, however the last two years have remained fairly steady. In 1997, 11.7% of employees in transportation were employed by levels I – IV air carriers. This was down slightly from the previous year, which saw air carrier employment level at 11.85% of total transportation employment. As a percentage of the overall economy, air carriers employ slightly more employee's than previous years. The table below outlines the level of air carrier employment as a percentage of transportation employment and all employment.

Table 8: Air Carriers Share of Total Employees

Year	% of Transport	% of Economy
1997	11.7	0.47
1996	11.85	0.47
1995	11.4	0.46
1994	10.8	0.45
1993	10.7	0.45

(Source: Statistics Canada, 1999 courtesy of Transport Canada)

3.1.2 Salaries and Wages of Canadian Air Carriers

Air carriers paid out over $2.5 million in wages and salaries in 1997. The average salary for employees with air carriers in 1997 was $47,546, up slightly from the 1996 average salary at $47,437. Calculated in 1992 dollars, the average salary in 1997 was $39,145, down from the previous year at $40,265. As the table below shows, calculated in current dollars, average salaries have increased, however slightly, each year from 1993. Calculated using 1992 dollars however, average salaries have remained relatively stable.

Table 9: Average Salaries of Air Carrier Employees

Year	Current Dollars	1992 Dollars
1997	$47,546	$39,145
1996	$47,437	$40,265
1995	$44,958	$39,649
1994	$42,152	$39,099
1993	$41,729	$40,435

(Source: Statistics Canada, 1999 courtesy of Transport Canada)

3.1.3 Productivity

Over the last 5 years, employees with passenger air carriers have increased their productivity 35%, from 4.2 passenger-kilometres in 1993 to 5.8 passenger-kilometres in 1997. Similarly employees with cargo carriers have increased their productivity in tonne-kilometres per employee by 34% from 1993 to 1997.

Table 10: Productivity of Employees with Cargo and Passenger Carriers

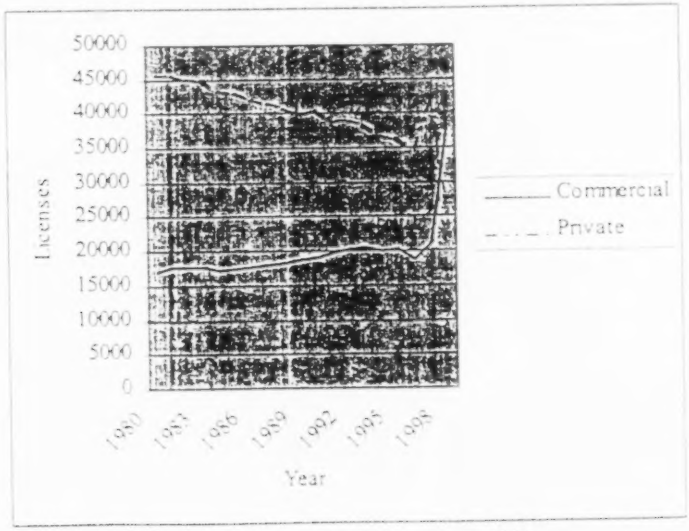
Year	Tonne-kms per employee	Passenger-kms per employee
1997	6.8	5.8
1996	6.3	5.3
1995	5.8	4.9
1994	5.4	4.6
1993	5.1	4.3

(Source: Statistics Canada, 1999, courtesy of Transport Canada)

3.2 Pilots

Last year there were over 61,200 commercial and private pilots in Canada. Examined over an 18 year period, the numbers of licensed pilots has fluctuated from year to year, but remains within the range of 53,401 and 63,450. The early 1980s saw nearly twice the number of private pilots than in recent years, while the numbers of commercial pilots has more than doubled since 1980. As the graph below shows, the numbers of private pilots have slowly but steadily declined since the 1980s, with the largest decrease in most recent years. The trend among commercial pilots is almost exactly the opposite; there has been a slow increase from the early 1980s until the late 1990s, with a dramatic rise from 1996 to 1998.

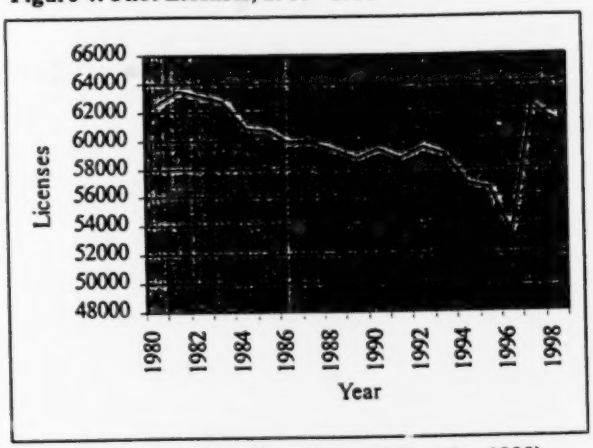
Figure 3: Commercial v. private licenses



(Source: Transport Canada, Safety and Security, 1999)

As the graph below shows, the total number of licensed pilots had been declining steadily since the 1980s. Starting in 1996, however, there was a sharp increase in the number of pilots. As private licenses appear to be on the decline, this increase is due to the dramatic rise in commercial pilots.

Figure 4: Pilot Licenses, 1980 - 1998



(Source: Transport Canada, Safety and Security, 1999)

3.2.1 National Pilots Study

With the introduction of space-age technology, changes in operating procedures and innovations in aircraft designs, the skill requirements of pilots have reached new heights. In response, Canada's aviation industry, in partnership with Human Resources Development Canada, is undertaking a national human resource study of its commercial pilots. The purpose of the study is to "fashion a blue print able to provide the industry with a coordinated, more responsive framework around which policy-makers, managers, and pilots, training institutes, airlines, and labour organizations are better able to plan for the future."[18]

In conducting this study, the industry hopes to address skills/training gaps, national minimum training standards, improved training and re-training programs and on-going mechanisms for long and short term human resource planning and development. Such human resource planning can be difficult as the industry is heavily influenced by the world economy. However, due to the long periods of time to reach the level of training and experience needed to produce a well-qualified pilot, such planning is necessary.[19]

3.2.2 Saskatchewan

In Saskatchewan there are over 100 commercial operators and over 300 commercial pilots. While there are 8 licensed flight training units (FTU) in the province, there is no college level training facility. With the recent announcement that Transport Canada will soon increase the requisite number of ground school hours from 40 to 400, there is concern among the provincial industry that current FTUs will not have the capacity to fulfill the new requirements. If current FTUs cannot handle the capacity required in the near future, Saskatchewan residents seeking

[18] Human Resource Study of Commercial Pilots in Canada, Terms of Reference, Third Draft, 1999.
[19] Ibid.

pilot training may have to leave the province for training. As well, any influx of people from outside the province to take training will halt, as will the economic benefits attached to it.

Saskatchewan operators are also experiencing the effects of the rapid world-wide growth in aviation. Pilots who start with small operators or as flying instructors can quickly move up to larger carriers, better pay and better benefits. Difficulties in keeping experienced pilots means small operators must rely more heavily on entry-level pilots and deal with the difficulties surrounding turnover, such as training costs.

In response to the demand for pilots and the shortage of trained and experienced personnel, the Saskatchewan Aviation Council is leading a study to determine the long-term human resource and training needs in the industry.

3.3 Aircraft Maintenance Engineers

While the national pilot's study is soon to be launched and Saskatchewan is conducting a study of which pilots and AMEs are a part, the Canadian Aviation Maintenance Council is setting an example of industry wide human resource planning. The CAMC is a non-profit organization established in partnership with Human Resources Development Canada whose mission it is to develop a framework for and facilitate the implementation of a human resource strategy for the aviation maintenance industry.

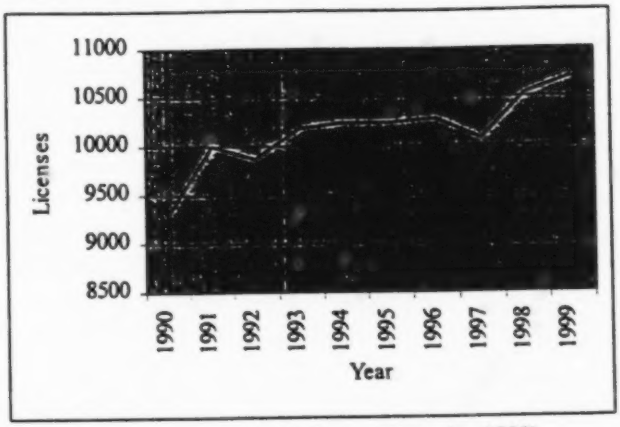
The goals of the CAMC are:

- To establish national minimum standards for specified skilled trades within the aviation maintenance industry;
- To facilitate improved training and re-training programs for all occupations in the industry;
- To establish on-going mechanisms for industry-wide human resource planning and development;
- To develop effective recruitment and retention strategies for potential entrants and the existing workforce.

3.3.1 AME Statistics

While technicians and AMEs must purchase membership in CAMC, the potential constituency of CAMC is very large. According to Transport Canada there are 10,711-licensed AMEs across the country; number that has been growing steadily since 1993. The current number is more than double the number of AMEs in 1980. This growth is demonstrated in the chart below.

Figure 5: Licensed AMEs, 1990 - 1999



(Source: Transport Canada, Safety and Security, 1999)

3.3.2 Future Supply and Demand

While the CAMC is predicting growth in the aircraft maintenance industry and an increased demand for AMEs, the organization has not quantified future demand. Their predictions are based in part on their direct experiences and US statistics. The CAMC has learned that the US is predicting it will need 155,000 A&P technicians by 2006, a 13% increase from the 137,000 now employed. Compounding this is attrition and a declining enrollment in A & P courses; these two factors push the requirement up to 50,000 new students needed per year to meet attrition and growth. New entrants into the aviation maintenance field in the US numbered 26,000 in 1991, a number which fell to 7,500 in 1997. The US has some definite challenges ahead, and the CAMC is recognizing that Canada, which often follows US trends, has an opportunity to identify and deal with labour market requirement for AMEs. CAMC is working with its membership to gather the required information to help all the interested stakeholders get the information they need.[20]

3.3.3 Saskatchewan & Training

There are currently 16 aircraft training organizations in Canada, located in every province except Saskatchewan. While there is one correspondence course available, Saskatchewan residents wishing to train at an institution must go out of province. As well, as of September 1, 2001 Transport Canada will no longer administer technical examinations. Saskatchewan residents will then have to go out of province to challenge the exams unless an out-of-province ATO begins to administer examinations in Saskatchewan.[21]

[20] "From the Executive Director's Desk," by Bill Weston, CAMC, July 1999.
[21] Transport Canada

4 Conclusion

Airlines carry passengers and cargo all over the world, and with the break down of old borders in Eastern Europe and the growth of the numbers of people who can afford air travel, the international air transport industry is forecasting major market growth.

Canada is a beneficiary of this international trend. After undergoing significant changes in the structure in the industry, Canadian air carriers are poised to benefit from the burgeoning market. The Open Skies agreement with the United States, traffic to the Asia Pacific region, and the attractiveness of Canadian training to foreign countries will have a positive impact on the growth of the industry. Canada's leading position in the aerospace industry and its quality training put the nation's industry in a position to capitalize on growth.

There are challenges however. While Canada is on the leading edge of technology, there are questions about the ability of personnel to handle that technology. Reduced vertical space between aircraft and more crowded skies are becoming increasing safety concerns. Research into human factors and high quality training can help mitigate the dangers. In Saskatchewan, and nationally, in terms of pilots and AMEs, studies are being conducted to determine long term human resource needs and devise a plan to meet those needs. Safety is becoming a key issue for the CAMC and will no doubt arise in other areas.

Employment levels in Canada's aviation industry are rising, fueled in part by the recruitment of personnel from small carriers by Canada's large carriers. While the industry has a high average earnings rate, the average salary has leveled off in the last 5 years when calculated in 1992 dollars. As increasing numbers of people and cargo are travelling on Canada's airlines, employee productivity levels have also increased by 35% in the passengers business from 1993 to 1997 and 34% in cargo those same years.

Pilots and AMEs are the largest group of employees in aviation and have received the most attention. The CAMC was formed after a national study exploring the future needs of the aviation maintenance field. Their goal is to develop a framework for and facilitate the implementation of a human resource strategy for the aviation maintenance industry. Currently, a study is being designed to examine the status and future human resource and training requirements for pilots in Canada. In conducting this study, the industry hopes to address skills/training gaps, national minimum training standards, improved training and re-training programs and on-going mechanisms for long and short term human resource planning and development. In Saskatchewan, the aviation industry is conducting a broader study. Pilots and AMEs are key elements, but the work will also encompass the other occupations in the industry.

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6 Flight Training Database

College Training

Alberta

School	Unit	Address	Phone	Fax & email
Edmonton Flight College	Aeroplane	Building No. 18, Municipal Airport 49 Airport Road Edmonton, AB T5G 0W6	403-454-4531	403-454-7141
Mount Royal College	Aeroplane	4825 Richard Road S.W. Calgary, AB T3E 6K6	403-240-6156	403-288-9551
Prairie Bible College	Aeroplane	Box 4000 Three Hills, AB T0M 2A0	403-443-2349	403-443-7142

Private Training

Saskatchewan

School	Unit	Address	Phone	Fax & email
Anderson Aviation Ltd.	Aeroplane	P.O. Box 621 Kindersley, SK S0L 1S0	306-463-2835	306-463-1051
Border City Aviation Ltd.	Aeroplane	Box 963 Lloydminster, SK/AB S9V 0Y9	403-875-5834	
Champion Air Park	Aeroplane	P.O. Box 436 Churchbridge, SK S0A 0M0	306-896-2873	306-896-2873
Nipawin Flight Centre	Aeroplane	P.O. Box 209 Nipawin, SK S0E 1E0	306-862-4451	306-862-2387
Leading Edge Aviation Ltd.	Aeroplane	P.O. Box 1477 Yorkton, SK S3N 3G3	306-783-0321	306-782-9562
Battlefords Air	Aeroplane	P.O. Box 1393 North Battleford, SK S9A 3M1	306-445-3099	306-445-2347
Mitchinson Flying Service Ltd.	Aeroplane	P.O. Box 1521 Saskatoon, SK S7K 3R3	306-244-6714	306-244-6741
National Aviation College	Aeroplane	P.O. Box 66 Prince Albert, SK S6V 5R4	306-764-6013	306-763-6532
Regina Flying Club (1944)	Aeroplane	2610 Airport Road Regina, SK S4W 1A3	306-525-6194	306-525-6196
Sunrise Aviation Co. Inc.	Aeroplane	1607 Dieppe Crescent Estevan, SK S4A 1W8	306-634-8668	306-634-9790

Manitoba

School	Unit	Address	Phone	Fax & email
Canadian Aviation Training Centre	Aeroplane	P.O. Box 305 Southport, MB R0H 1N0	204-428-4040	204-428-4376
Best-Aviation (1982) Limited	Aeroplane	P.O. Box 2248 Morden, MB R0G 1J0	204-822-5125	204-822-5606
Brandon Flying Club	Aeroplane	R.R. #5, Site 520, Box 18 Brandon, MB R7A 5Y5	204-728-7691	204-727-8213
Dauphin Air Service	Aeroplane	P.O. Box 830 Dauphin MB R7N 3B3	204-638-6383	204-638-8299
Flying Colors Pilot Training	Aeroplane	30 Hangar Line Road Winnipeg, MB R3J 3Y7	204-943-9000	204-943-9000 www.flying-colors.org
Harv's Air Service Ltd.	Aeroplane	P.O. Box 1056 Steinbach, MB R0A 2A0	204-326-2434	204-326-4182
Pilot Training Centre	Aeroplane	P.O. Box 1770 Gimli, MB R0C 1B0	204-642-8560	204-642-8538
Maple Leaf Aviation Limited	Aeroplane	Group 520, P.O. Box 16, R.R. #5 Brandon, MB R7A 5Y5	204-728-7618	204-725-1719
Perimeter Aviation Limited	Aeroplane	626 Ferry Road Winnipeg, MB R3H 0T7	204-786-7031	204-783-8000
Shoal Lake Aviation Ltd.	Aeroplane	General Delivery Shoal Lake, MB R0J 1Z0	204-759-2395	204-759-2395
Winair Services Ltd.	Aeroplane	30 Hangar Line Road Winnpeg, MB R3J 3Y7	204-227-5131	204-895-1346
Winnipeg Aviation Co. (1984) Ltd.	Aeroplane	700 South Gate Road St. Andrews, MB R1A 3P8	204-338-7923	204-338-7924
Winnipeg Flying Club	Aeroplane	601 Club Road, Unit 100 St. Andrews, MB R1A 3P6	204-338-7927	204-338-7920

Alberta

School	Unit	Address	Phone	Fax & email
Camrose Flight Centre	Aeroplane	Box 1888 Camrose, AB T4V 1X8	403-672-1810	403-672-1810
All-West Air Services Ltd.	Aeroplane	#250 – 5438 – 11th Street NE Calgary, AB T2E 7E9	403-295-7700	

Bar XH Air Inc.	Aeroplane	Box 161 Medicine Hat, AB T1A 7E8	403-527-5141	
Canadian Flight Training Centre	Aeroplane	Box 15, Site, 16, R.R. #2 Calgary, AB T2P 2G5	403-247-2799	403-247-2753
Calgary Flight Training Centre Inc.	Aeroplane	Hangar 11, Calgary Int'l Airport 2, 820 McTavish Road NE Calgary, AB T2E 7G6	403-291-9393	403-291-2989
Calgary Flying Club	Aeroplane	Springbank Airport Box 5, Site 16, R.R. #2 Calgary AB T2P 2G5	403-288-8831	403-286-9763
Centennial Flight Centre Ltd.	Aeroplane	Building 15, Municipal Airport 25 Airport Road Edmonton, AB T5G 0W6	403-451-4951	
Cooking Lake Aviation Academy Inc.	Aeroplane	C/O #25, 52063 Rge. Rd. 225 Sherwood Park, AB T8C 1C3	403-922-2802	403-922-2872
Edmonton Flying Club	Aeroplane	Building No. 18, Municipal Airport 49 Airport Road Edmonton, AB T5G 0W6	403-454-4531	403-454-7141
Strathcona Flight School	Aeroplane	P.O. Box 59061 Riverbend Road Edmonton, AB T6H 5Y3	403-910-7973	403-435-5581
Great International Flight Training	Aeroplane	5736 – 103A Street Edmonton, AB T6H 2J5	780-460-8693	780-458-9863
High River Flight Centre (1999) Ltd.	Aeroplane	Box 5337 High River, AB T1V 1M5	403-652-3444	403-601-0937
Kewetin Flight Training Centre Inc.	Aeroplane	Box 584 Ft. Vermilion, AB	780-927-4630	780-927-3667
L F C Flight Centre Ltd.	Aeroplane	Box 2290 Lethbridge, AB T1J 4K7	403-327-3313	403-327-3313
Lloyd Air	Aeroplane	Box 1431 Lloydminster, AB S9V 1K4	403-875-2347	403-875-1400
Morgan Air Services Co. Ltd.	Aeroplane	840 McTavish Road NE Calgary AB T2E 7G6	403-291-3644	403-250-7110
McMurray Aviation Ltd.	Aeroplane	Site 1, Box 5, R.R. #1 Fort McMurray, AB T9H 5B4	403-791-2182	
Namao Flying Club	Aeroplane	Site 2, Box 69, R.R. #1 St. Albert, AB T8N 1M8	403-419-6777	403-419-6711
Northern Air Charter (P.R.) Inc.	Aeroplane	Box 677 Grimshaw, AB T0H 1W0	403-624-1911	403-624-1155

Peace Air Ltd.	Aeroplane	Grande Prairie Airport Grande Prairie, AB T8V 2Z9	780-532-5528	780-532-5350
Peacock Aero Flight Centre Ltd.	Aeroplane	Box 9, Site 16, R.R. #2 Calgary, AB T2P 2G5	403-288-5118	403-286-5166
Red Aero Aviation	Aeroplane	Site 16, Box 13, R.R. #2 Calgary, AB T2P 2G5	403-247-4933	403-247-6599
Sky Wings Aviation Academy Ltd.	Aeroplane	Box 293 Okotoks, AB T0L 1T0	403-938-5252	403-938-5253
Sky Wings Aviation Academy Ltd.	Aeroplane	Box 190 Penhold, AB T0M 1R0	403-886-5191	403-886-4279
Westpoint School of Aviation Inc.	Aeroplane	765 McTavish Road NE Calgary, AB T2E 7G8	403-250-3321	403-250-3851
Wetaskiwin Air Services Ltd.	Aeroplane	Box 6444 Wetaskiwin, AB T9A 2G2	780-352-5643	780-352-7148
Westpoint School of Aviation	Aeroplane	Box 4, Site 16, R.R. #2 Calgary, AB T2P 2G5	403-288-0227	403-286-1664
Flight Squadron	Aeroplane	Hangar 25, 145 Airport Road Edmonton, AB T5E 0W6	403-454-5980	403-455-6384

7 Aircraft Maintenance Engineer Training Database

College Diplomas

Alberta

School	Programs	Location	Phone & Fax	Email/website
Northern Alberta Institute of Technology	• Aircraft Skin and Structure Repair	11762 – 106 Street Edmonton AB T5G 2R1	P: 780-471-6248 F: 780-471-8583	www.webstar.nait.ab.ca
Southern Alberta Institute of Technology	• Aeronautical Engineering Technology • Aircraft Maintenance Engineers Technology • Avionics Engineering Technology	1301 – 16th Avenue NW Calgary AB T2M 0L4	P: 780-284-8641 F: 780-284-8940	www.campuscan.com

Manitoba

School	Programs	Location	Phone & Fax	Email/website
Stevenson Aviation Technical Training Centre	• Aircraft Mechanic	P.O. Box 237 Southport MB R0H 1N0	1-800-665-9864	
Red River Community College	• Gas Turbine Overhaul • Assembly Technician • Plastics Technician	205 Notre Dame Ave Winnipeg MB R3H 0J9	1-800-585-2121 1-800-903-7707 F: 204-948-3737	

British Columbia

School	Programs	Location	Phone & Fax	Email/website
British Columbia Institute of Technology	• Aircraft Maintenance Engineering – Category M • Aircraft Gas Turbine Technician • Aircraft Structures Technician • Aircraft electronics Technician	3700 Willingdon Avenue Burnaby BC V5G 3H2	P: 604-434-5734 F: 604-434-6243	www.bcit.bc.ca
Northern Lights College	• Aircraft Maintenance Engineering	11301 – 8th Street Dawson Creek BC V1G 4G2	P: 604-782-5251 F: 604-782-6069	www.nlc.bc.ca

Ontario

School	Programs	Location	Phone & Fax	Email/website
Canadore College of Applied Arts & Technology	• Aviation Technician – Aircraft Maintenance • Aviation Technician – Avionics Maintenance	100 College Drive P.O. Box 5001 North Bay ON P3B 8K9	P: 705-474-7600 F: 705-474-2384 TDD: 705-495-2862	www.canadorec.on.ca
Centennial College	• Aviation Technician – Aircraft Maintenance • Aviation Technician – Avionics Maintenance	P.O. Box 631, Station A Scarborough ON	P: 416-694-3241	www.cencol.on.ca
Sault College of Applied Arts & Technology	• Aircraft Structural Repair Technician • Aviation Machining • Aviation Welding	443 Northern Avenue Sault Ste. Marie, ON P6A 5L3	P: 705-759-6724 F: 705-759-1319 1-800-461-2260	www.saultc.on.ca
Confederation College	• Aviation Technician • Aircraft Maintenance • Aviation (Manufacturing) • Engineering Technology	Box 398 Thunder Bay, ON T7C 4W1	P: 807-475-6610 807-473-2400	

University Degrees

Alberta

School	Programs	Location	Phone & Fax	Email/website
University of Alberta	• Electrical Engineering • Mechanical Engineering • Computer Engineering • Engineering Physics • Metallurgical Engineering	Faculty of Engineering Edmonton AB T6G 2G8	P: 780-492-3111	www.ualberta.ca
University of Calgary	• Mechanical Engineering • Electrical Engineering	Faculty of Engineering Calgary AB T2N 1N4	P: 403-220-5110 F: 403-282-7298	www.ucalgary.ca

Manitoba

School	Programs	Location	Phone & Fax	Email/website
University of Manitoba	• Computer Engineering • Electrical Engineering • Industrial Engineering • Mechanical Engineering	Faculty of Engineering Winnipeg MB R3T 2N2	P: 204 474-8880	www.umanitoba.ca

British Columbia

School	Programs	Location	Phone & Fax	Email/website
University of British Columbia	• Electrical Engineering • Engineering Physics • Mechanical Engineering • Metallurgical Engineering • Metals and Materials Engineering	Faculty of Applied Science Vancouver BC V6T 1Z4	P: (604) 822-2211	www.ubc.ca
University of Victoria	• Computer Engineering • Electrical Engineering • Mechanical Engineering	Faculty of Engineering Victoria BC V8W 2Y2	P: 250-721-7211	www.uvic.ca

Ontario

School	Programs	Location	Phone & Fax	Email/website
Carleton University	• Computer Engineering • Electrical Engineering • Mechanical Engineering • Bachelor of Engineering (Aerospace)	Faculty of Engineering Ottawa ON K1S 5B6	P: 613-520-7400	www.carleton.ca
Lakehead University	• Electrical Engineering • Mechanical Engineering	Faculty of Engineering Thunder Bay ON P7B 5E1	P: 807-343-8110 F: 807-343-8023	www.lakeheadu.ca
McMaster University	• Computer Engineering • Electrical Engineering • Engineering Physics • Mechanical Engineering • Metallurgical Engineering	Faculty of Engineering McMaster University Hamilton ON L8S 4L7	P: 905-525-9140	www.mcmaster.ca
Queen's University	• Electrical Engineering • Engineering Physics • Mechanical Engineering • Metallurgical Engineering	Faculty of Applied Science Queen's University Kingston ON K7L 3N6	P: 613-533-2000	www.queensu.ca
Royal Military College of Canada	• Computer Engineering • Electrical Engineering • Engineering Physics • Mechanical Engineering	Royal Military College of Canada PO Box 17000 Stn Forces Kingston, Ontario K7K 7B4	P: 613-541-6000	www.rmc.ca
Ryerson Polytechnic University	• Electrical Engineering • Industrial Engineering	Faculty of Engineering and Applied Science	P: 416-979-5000	www.ryerson.ca

	• Mechanical Engineering • Bachelor of Engineering (Aerospace)	Toronto ON M5B 2K3		
University of Ottawa	• Computer Engineering • Electrical Engineering • Mechanical Engineering	Faculty of Engineering Ottawa ON K1N 6N5	P: 613-562-5700	www.uottawa.ca
University of Toronto	• Computer Engineering • Electrical Engineering • Industrial Engineering • Mechanical Engineering • Materials Engineering • Metallurgical Engineering • Aerospace Science and Engineering	Faculty of Applied Science and Engineering Division of Engineering Science Galbraith Building room 149 35 George Street Toronto ON M5S 1A4	P: 416-978-2903 F: 416-978-0828	www.utoronto.ca
University of Waterloo	• Computer Engineering • Electrical Engineering • Mechanical Engineering • Systems Design Engineering	Faculty of Engineering Waterloo ON N2L 3G1	P: 519-888-4567	www.uwaterloo.ca
University of Western Ontario	• Electrical Engineering • Materials Engineering • Mechanical Engineering	Faculty of Engineering Science London ON N6A 5B9	P: 519-661-2111	www.uwo.ca
University of Windsor	• Electrical Engineering • Industrial Engineering • Mechanical Engineering	Faculty of Engineering Windsor ON N9B 3P4	P: 519-253-4232 Ext: 2566 or 2565	www.uwindsor.ca
York University	• Space and Communication Sciences Program	4700 Keele Street North York ON M3J 1P3	P: 416-736-5085	www.yorku.ca